

Rita Salisbury Beach Replenishment NOAA TAS PROGRAM LESSON PLAN

Activity Title: Beach Replenishment Town Meeting

Subject (Focus/Topic): The pros and cons of a beach replenishment project

Grade Level: 12th

Average Learning Time: 3 90-minute class periods: Day One -research, Day Two -crafting arguments, Day Three-Town Meeting

Lesson Summary (Overview/Purpose): Students will research the environmental and/or economic impact of a beach replenishment program at a local beach.

Overall Concept (Big Idea/Essential Question): Is it worth the biologic repercussions involved and money spent to replenish our local beaches?

Specific Concepts (Key Concepts):

1. Coastlines move in response to many natural forces.
2. Beach replenishment is a multi-faceted issue.
3. Beach replenishment is a stopgap measure with long-reaching effects on the environment.

Focus Questions (Specific Questions):

1. What does beach replenishment in Delaware entail?
2. Beach replenishment is an ongoing program; is it worth the money to replenish Delaware beaches when winter storms, tides, and sea-level rise just wash it away?
3. Who should be responsible for paying for the replenishment programs? Federal/state governments or individuals?
4. What is the environmental impact of beach replenishment, both positive and negative?
5. How does the environmental impact relate to the economic impact of beach replenishment?
6. How does beach replenishment affect individuals in our area?

Objectives/Learning Goals: Given a town meeting scenario, students will be able to present their assigned viewpoint on beach replenishment with a minimum of 10 supporting facts.

Background Information: Students need to know the idea and form behind town meetings. It might help to have a local councilman talk to students or have a video of one of the local councils in action.

Students need to know what beach replenishment is and the methods used locally. According to Army Corps of Engineers research, approximately 75% of U.S. vacations are spent at the beach. This fact creates a high level of interest in preserving and protecting the resort areas from damage. A “fully-nourished” beach it acts as a buffer and protects buildings and infrastructure on the land. Storm action carries sand offshore and makes storm waves break further offshore, protecting the land. The cost of replacing the sand is far less than the cost of repairing storm-damaged properties. This cost is usually shared between state and local governments and, sometimes, federal monies can be appropriated.

However, there are many geologists that disagree with the basic designs used by the Engineers, citing established findings about how the beach system actually works.

This ties into my Teacher at Sea experience aboard the Oscar Elton Sette by focusing on how we affect our local marine environment. From my blog, I wrote the following: *The goal of the Hawaii Bottomfish Survey is to gain more information about the fish populations in the ocean around Hawaii. The survey will help scientists determine the effects of fishing and other factors on the overall health of different fish populations. By gathering information by non-lethal methods NOAA scientists are adding to their knowledge base without further reducing the fish population.*

One of the main reasons I cited for wanting to be part of the *Hawaii Bottomfish Survey* was: *Crabbing and fishing were common summertime activities for kids when I grew up but most of my students have never had the opportunity to take part in either due to changes in the water quality. I am looking forward to incorporating what I learn on the Sette into projects for my students in order to create an awareness of the area in which they live and its historic marine culture. With that awareness as a foundation, can an interest in improving the bays and their tributaries be far behind?*

The Hawaii Bottomfish survey was, in part, a response to government quotas on fishing limits in the Hawaiian waters. It was part of an ongoing effort to set baselines to determine if overfishing is a problem. Overfishing would be a manmade problem that affects marine life and the economics of the area. Dredging off Delaware coasts to replenish Delaware beaches is also a response to manmade problems—specifically coastal development. It affects not only marine life, but also the economics of the area. It is a subject that is in the forefront of our area's environmental news and I believe it contains a valuable and valid lesson.

Common Misconceptions/Preconceptions: A common misconception is that if the government pays for something then there is no cost to individuals involved. Through this investigation students will identify economic factors that effect individuals and business. Additionally, students are unaware that disturbance or disruption of abiotic factors has a ripple effect that only starts with the original disturbed niche and spreads out to affect both biotic and abiotic elements in the ecosystem.

Materials:

Laptops with Internet access to news sites

In addition to current events, students should have access to documents such as this <http://www.asafc.org/uploads/file/beachNourishment.pdf> for reference.

Technical Requirements: Internet access

Teacher Preparation:

Set up ground rules for the town meeting: individuals take turns, no interrupting each other, time limits for presentations, etc.

Pre-select some current events about Delaware replenishment.

Assign roles to students to include homeowners, business owners, marine biologists, environmental activists, USGS and Army Corp of Engineer representatives, government officials (local, state, and federal), Delaware Emergency Management Agency representative, and Delaware Environmental Observing System (DEOS) representative

Keywords: replenishment, activism, turbidity, dredge

Pre-assessment Strategy/Anticipatory Set (Optional): Beach replenishment is an ongoing activity in Delaware so current articles or video clips on replenishment are readily accessible. View/read one as a class, and discuss the dredging process.

Lesson Procedure:

1. After reading/viewing the current event, hand out the criteria and grading rubric for the assignment.
2. Create a Know/Need to Know chart as a class.
3. Draw slips of paper for town meeting roles. Give an overview of each role, but allow students to research some roles more in-depth on their own.
4. Have students copy focus questions into their notebooks so they can add their notes and possible responses appropriate to their assigned character.
5. Monitor student research online and guide the preparation for the roles.
6. Students will create posters or PowerPoints to use in their presentation as visual aids.
7. Students will convene a “town meeting” and present their viewpoint using their visual aid(s)

Assessment and Evaluation: Students’ presentation will be scored using the accompanying rubric. If done as part of a cross-curricular project, Economics (Social Studies) and Oral Communication (English/Language Arts), as well as Mathematics can all be drawn into the project to create a larger, more encompassing event.

Standards:

- **National Science Education Standards:** Science as Inquiry, Earth and Space Science, and Science in Personal and Social Perspectives
- **Ocean Literacy Principles Addressed:**
 - 2C: Erosion-the wearing away of rock, soil and other biotic and abiotic earth materials-occur in coastal areas as wind, waves, and currents in rivers and the ocean, and the processes associated with plate tectonics move sediments. Most beach sand (tiny bits of animals, plants, rocks, and minerals) is eroded from land sources and carried to the coast by rivers; sand is also eroded from coastal sources by surf. Sand is redistributed seasonally by waves and coastal currents.
 - 2E: Tectonic activity, sea level changes, and the force of waves influence the physical structure and landforms of the coast.
 - 6B: The ocean provides food, medicines, and mineral and energy resources. It supports jobs and national economies, serves as a highway for transportation of goods and people, and plays a role in national security.
 - 6D: Humans affect the ocean in a variety of ways. Laws, regulations, and resource management affect what is taken out and put into the ocean. Human development and activity leads to pollution (point source, non-point source, and noise pollution), changes to ocean chemistry (ocean acidification), and physical modifications (changes to beaches, shores, and rivers). In addition, humans have removed most of the large vertebrates from the ocean.
 - 6G: Everyone is responsible for caring for the ocean. The ocean sustains life on Earth and humans must live in ways that sustain the ocean. Individual and collective actions are needed to effectively manage ocean resources for all.

Next Generation Science Standards Addressed:

Ecosystems: Interactions, Energy, and Dynamics: HS-LS2 Science and Engineering Practices: Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.

- Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS2-6)
- Evaluate the evidence behind currently accepted explanations to determine the merits of arguments. (HS-LS2-8)

Additional Resources:

- Beach Nourishment: A Review of Biological and Physical Impacts by Atlantic States Marine Fisheries Commission: <http://www.asmfc.org/uploads/file/beachNourishment.pdf>
- Multiple Papers Specific to Delaware Beach Replenishment: <http://www.wcu.edu/academics/research/program-for-the-study-of-developed-shorelines/projects-and-documents/strategic-coastal-retreat-study/coastal-economics.asp>
- Beach Rebuilding Rides a Popular Wave: <http://www.washingtonpost.com/wp-srv/local/longterm/library/beach/nourish.htm>
- 3:13m video <http://www.delawareonline.com/VideoNetwork/1792663536001/Delaware-beach-replenishment-worth-the-time-money>
- Dewey Beach Public Notice <http://www.townofdeweybeach.com/index.cfm?fuseaction=content.pageDetails&id=200430&typeID=24>
- Delaware's NPR: Vital Defense or Futile Gesture? <http://www.wdde.org/45346-delaware-beach-replenishment>
- Summer Beach Pumping In Delaware Raises Questions: <http://mdcoastdispatch.com/2013/07/25/summer-beach-pumping-in-delaware-raises-questions-2/>
- Heather Daniel paper: Replenishment vs Retreat: http://www.wcu.edu/WebFiles/PDFs/The_Cost_of_Maintaining_Delaware_Beaches.pdf
- Beach Replenishment: Vital Defense or Futile Gesture? <http://www.wvoc.com/story/3413236/beach-replenishment-moves-to-another-delaware-resort>
- Beach Replenishment Moves to Another Popular Resort: <http://www.washingtonpost.com/wp-srv/local/longterm/library/beach/nourish.htm>

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Town Meeting Beach Replenishment Presentation Rubric

	1	2	3	4	5
Content <i>Is the science accurate?</i>	Student shows no knowledge or understanding of content	Student has little knowledge or understanding of content	Student has some knowledge of the content and demonstrates a knowledge of one or two points of content	Student has a good knowledge of content and demonstrates a knowledge of the most important content	Student is extremely knowledgeable and demonstrates a deep understanding of all content
Supporting Facts	Students does not include any facts that support his/her viewpoint	Student includes 1 to 4 facts that support his/her viewpoint	Student includes 5 to 7 facts that support his/her viewpoint	Student includes 8 to 9 facts that support his/her viewpoint	Student includes 10 or more facts that support his/her viewpoint
Prepared-ness	Student does not seem at all prepared to present	Student is somewhat prepared but it is clear that rehearsal was lacking	Student is prepared but might have needed more rehearsal	Student is well prepared & rehearsed	Student is extremely well prepared, obviously rehearsed, & does not need notes
Visuals	Student does not use any visual aids	Some visuals relate to topic, are easy to read, and are cited	Most visuals relate to topic, are easy to read, and are cited	All visuals relate to topic, are easy to read, and most are cited	All visuals relate to topic, are easy to read, and are cited
Focus	Student was on topic less than 74% of the time	Student stayed on topic 75-84% of the time	Student stayed on topic most of the time and listened well to other presentations	Student stayed on topic almost all of the time and listened attentively to other presentations	Student stayed on topic all of the time and actively listened to other presentations